- FAULT MAPPER
  CABLE LENGTH METER
  AND FAULT LOCATOR
- FAULT MAPPER MEDIDOR
  DE LONGITUD DE CABLE Y
  LOCALIZADOR
- FAULT MAPPER MEDIDOR
  DO COMPRIMENTO DE CABO
  E LOCALIZADOR DA FALHA

CA7024

ENGLISH **User Manual**

ESPAÑOL **Manual de Instrucciones**

PORTUGUESE **Manual de Usuário**

AEMC® INSTRUMENTS

Statement of Compliance

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met its published specifications.

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer. For recalibration, please use our calibration services. Refer to our repair and calibration section at

Serial #: _____

Catalog #: 2127.80

Model #: CA7024

Please fill in the appropriate date as indicated:

Date Received: _____

Date Calibration Due: _____

AEMC® INSTRUMENTS

Table of Contents

INTRODUCTION

⚠ WARNING ⚠

- This instrument meets the safety requirements of IEC61010-1:1995.
- The Model CA7024 is designed for use on de-energized circuits only.
- Connection to line voltages will damage the instrument and could be hazardous to the operator.
- This instrument is protected against connection to telecom network voltages according to EN61326-1.
- Safety is the responsibility of the operator.

1.1 International Electrical Symbols

This symbol signifies that the instrument is protected by double or reinforced insulation.

This symbol on the instrument indicates a WARNING and that the operator must refer to the user manual for instructions before operating the instrument. In this manual, the symbol preceding instructions indicates that if the instructions are not followed, bodily injury, installation/sample and product damage may result.

Risk of electric shock. The voltage at the parts marked with this symbol may be dangerous.

1.2 Receiving Your Shipment

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim.

1.3 Ordering Information

Fault Mapper Model CA7024.....**Cat. #2127.80**

Includes meter, carrying case, BNC pigtail with alligator clips, 4 x 1.5V AA batteries, user manual and product warranty card.

1.3.1 Accessories and Replacement Parts

Tone Receiver / Cable Tracer Model TR03 .....**Cat. #2127.76**

PRODUCT FEATURES

2.1 Description

The Fault Mapper is a handheld, Alpha-Numeric, TDR (Time Domain Reflectometer) Cable Length Meter and Fault Locator, which is designed to measure the length of power and communication cables or to indicate the distance to a fault on the cable, given access to only one end.

By incorporating Fast-edge Step TDR Technology, the Fault Mapper measures cable length and indicates the distance to open or short circuit faults, to a range of 6000 ft (2000m) on at least two conductors.

The Fault Mapper indicates the cable length or fault distance and description alpha-numerically on a 128x64 Graphical LCD.

An internal library of standard cable types enables accurate measurement without the necessity of entering Velocity of Propagation (Vp) information, and the Fault Mapper automatically compensates for different cable impedances.

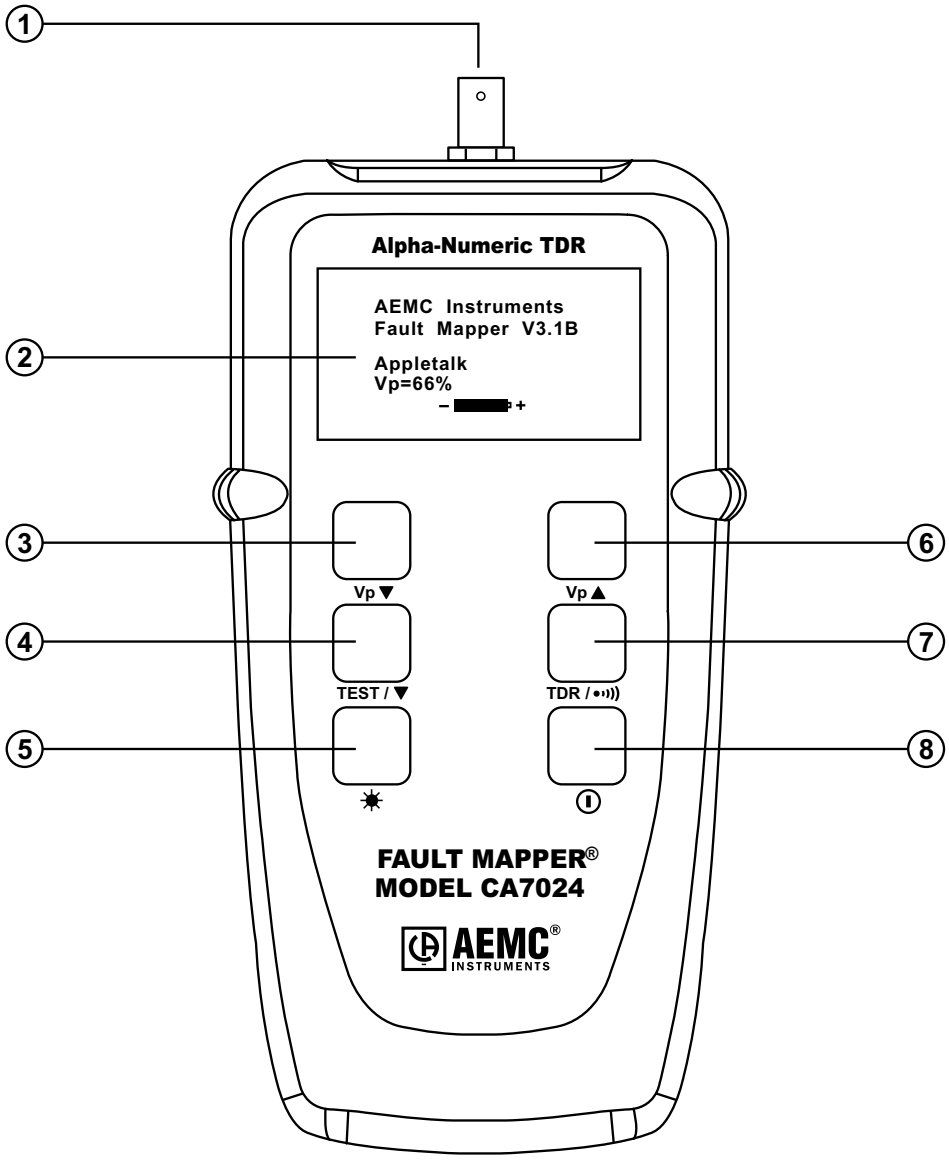
The Fault Mapper incorporates an oscillating tone generator, which is detectable with a standard cable tone tracer, for use in the tracing and identification of cable pairs.

The unit also displays a “Voltage Detected” warning and sounds an alarm when connected to a cable energized by more than 10V, which prohibits testing.

Features:

- Hand-held cable length meter and fault locator
- Measures cable length and indicates distance to open or short circuit faults to a range of 6000 ft (2000m)
- Indicates cable length, fault distance and description, alpha-numerically
- Emits an audible tone used to trace a cable and identify the type of fault
- Displays “Voltage Detected” and warning sound when >10V is present on the tested sample

2.2 Fault Mapper Features



1. BNC input connector
2. Alpha-Numeric LCD
3. Vp (Velocity of Propagation) decrement button
4. Test/function select button
5. Backlight button
6. Vp (Velocity of Propagation) increment button
7. Mode select button (TDR or Tone Tracer)
8. Power ON/OFF button

SPECIFICATIONS

Range @ Vp=70%:	6000 ft (2000m)
Resolution (m):	0.1 m up to 100 m, then 1 m
Resolution (ft):	0.1 ft up to 100 ft, then 1 ft
Accuracy*:	±2% of Reading
Minimum Cable Length:	12 ft (4m)
Cable Library:	Built-in
Vp (Velocity of Propagation):	Adjustable from 0 to 99%
Output Pulse:	5V peak-to-peak into open circuit
Output Impedance:	Automatic compensation
Output Pulse:	Nanosecond rise Step Function
Display Resolution:	128 x 64 pixel graphical LCD
Display Backlight:	Electroluminescent
Tone Generator:	Oscillating tone 810Hz - 1110Hz
Voltage Warning:	Triggers @ >10V (AC/DC)
Power Source:	4 x 1.5V AA alkaline batteries
Auto-off:	After 3 minutes
Storage Temperature:	-4 to 158°F (-20 to 70°C) 5 to 95% RH non-condensing
Operating Temperature:	32 to 112°F (0 to 40°C) 5 to 95% RH non-condensing
Altitude:	6000 ft (2000m) max
Dimensions:	6.5 x 3.5 x 1.5” (165 x 90 x 37mm)
Weight:	12 oz (350g)
Safety:	IEC61010-1 EN 60950
Index of Protection:	IP54
EMC:	EN 61326-1
CE:	Compliance with current EU directives

**Measurement accuracy of ±2% assumes the instrument setting for velocity of propagation (Vp) of the cable under test to be accurately set, and homogeneity of the velocity of propagation (Vp) along the cable length.*

Specifications are subject to change without notice.

OPERATION

4.1 Principles of Operation

The Fault Mapper works by measuring the time taken for a signal to travel to the far end of the cable under test, or to an intermediate fault and return.

The velocity at which the signal travels, or Velocity of Propagation (Vp), will depend on the characteristics of the cable.

Based on the selected Vp and the measured travel time of the test pulse, the Fault Mapper calculates and displays distance.

4.2 Accuracy and Velocity of Propagation (Vp)

The Fault Mapper measures distances to faults and cable lengths to an accuracy of ±2%.

This measurement accuracy is based upon the correct value of Vp being used for the cable under test, and homogeneity of the Vp along the cable length.

If the Vp is set incorrectly by the operator, or the Vp varies along the length of the cable, then additional errors will be incurred and the measurement accuracy will be affected.

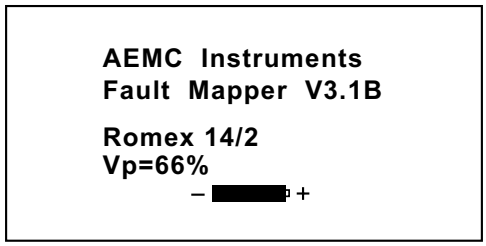
See § 4.9 for setting the Vp.

NOTE: The Vp is less well defined with unshielded multi-conductor cable, including power cable, and is lower when a cable is tightly wound on a drum than when it is installed in a linear fashion.

4.3 Getting Started

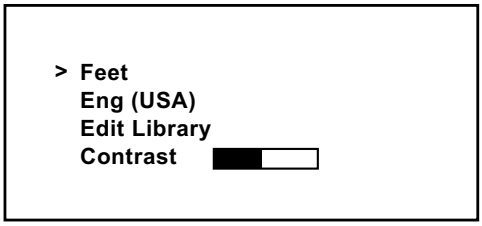
The instrument is switched on and off using the green power button ⏻, found on the lower right side of the front panel.

When the unit is first switched on it will display the opening screen giving the software version, the currently selected cable type/Velocity of Propagation, and remaining battery capacity.



4.4 Set-up Mode

Hold the **TDR / •))** button, then press the **TEST / ▼** button to enter Set-up mode.



- Measurement units can be set to Feet or Meters
- Languages can be set to: English, Français, Deutsch, Español or Italiano
- A user programmable library is available to store up to 15 customized settings
- The display contrast can adjusted

Press the **TEST / ▼** button to move the line selector (**>**) down the screen.

Press the **Vp ▲** or **Vp ▼** button to change the setting of the line selected.

Press the **TDR / •))** button again to save changes and exit set-up mode.

NOTE: When the Fault Mapper is turned off, it will remember the current set-up parameters. This feature is useful in the situation where the operator is performing many tests on the same type of cable.

4.5 Programming a Custom Library Location

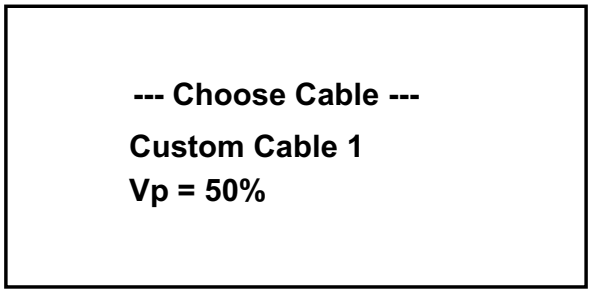
To program a custom library location, enter the **Set-up** mode (see § 4.4).

Press the **TEST / ▼** button to select Edit Library; the line selector (>) should be at Edit Library.

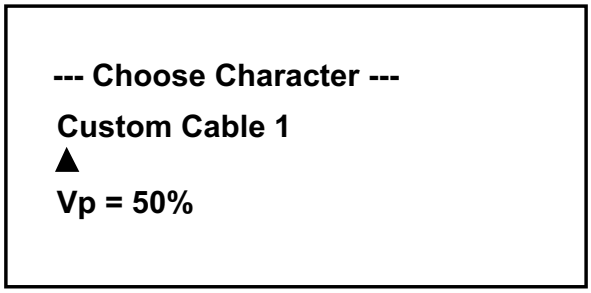
Press the **Vp ▲** or **Vp ▼** button to enter the library programming mode.

- The Model CA7024 will display the first programmable cable location in the library.
- The factory setting for each location is **Custom Cable X** with a **Vp = 50%**, where X is location 1 through 15.

Press the **Vp ▲** or **Vp ▼** button to choose a cable location to program.



Next, press the **TEST / ▼** button enter the **Choose Character** mode.



- The arrow cursor will point to the first character.
- Fifteen characters are available for cable naming.

Press the **Vp ▲** or **Vp ▼** button to move the selection cursor to the left or right respectively. Once the desired character is selected, press the **TEST / ▼** button to enter the **Edit Character** mode.

Next, press the **Vp ▲** or **Vp ▼** button to change the character at the selection point.

The available characters for each character location are:

Blank ! “ # $ % &’ ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I G J L M N O P Q R S T U V W X Y Z [\ ] ^ _ ` a b c d e f g h I j k l m n o p q r s t u v w x y z

When the desired character is selected, press the **TEST / ▼** button to move to the next character to edit.

After the last character is selected, press the **TEST / ▼** button again to move the cursor to the VP adjustment. Next, press the **Vp ▲** or **Vp ▼** button to increase or decrease the Vp, as necessary, for the cable type.

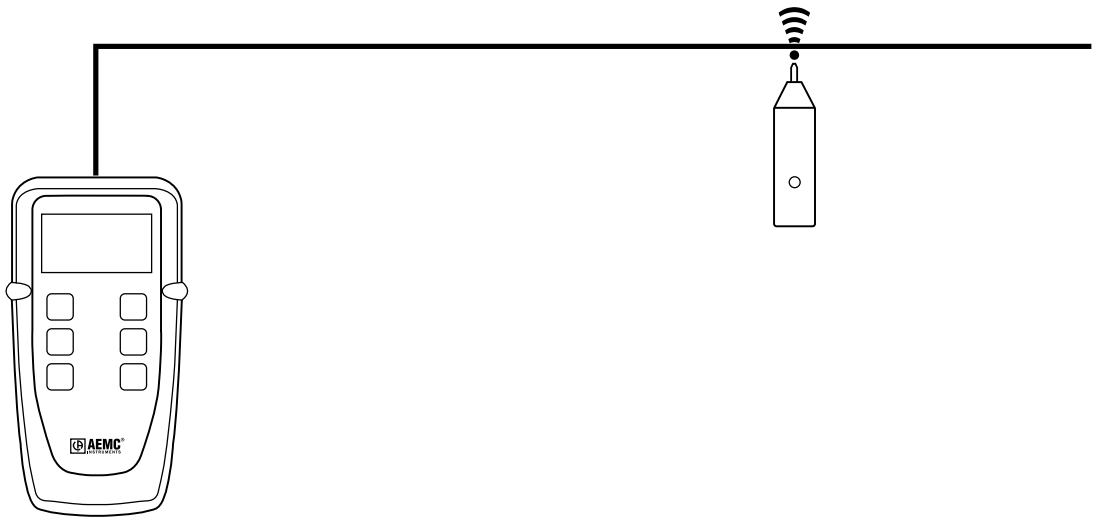
When the Vp selection is complete, press the **TDR / •ı))** button to return to the **Choose Character** mode and a second time to return to the **Choose Cable** mode. You may now define another cable for the library or press the **TDR / •ı))** button a third time to return to the main set up screen. Pressing the **TDR / •ı))** button again, at this point, will exit the **Set-up** mode.

4.6 Backlight

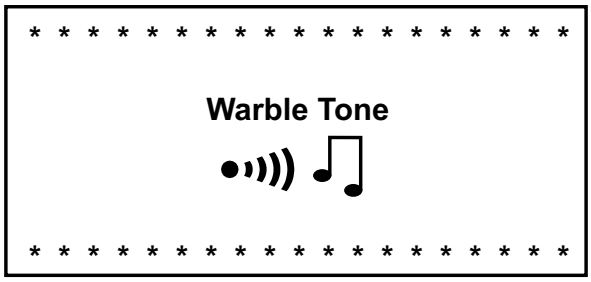
The display backlight is switched on and off with the ☀ button.

4.7 Tone Generator

The Fault Mapper may also be used as a tone generator, to trace and identify cables and wires. The user will need a cable tone tracer, such as the AEMC Tone Receiver/Cable Tracer Model TR03 (Cat. #2127.76) or equivalent.



Pressing the **TDR / •)))** button will inject a warbling (oscillating) tone into the cable or link under test. When set, the following will be displayed:



The injected signal oscillates between 810Hz and 1110Hz, six times per second.

NOTE: The auto-off function is disabled in Tone Generator mode, so that the tone can be injected into a cable for an extended period of time while tracing takes place.

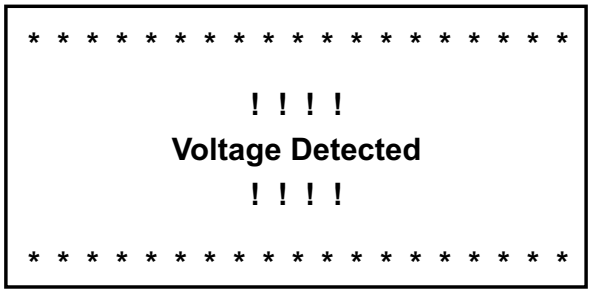
See §4.11 for attaching a cable to the Fault Mapper

4.8 Voltage Safety Warning (Live Sample)

The Fault Mapper is designed to work on non-energized cables only.

WARNING: If the Fault Mapper is accidentally connected to a cable carrying a voltage greater than 10V, a warning tone will be emitted, testing will be prohibited, and the warning display shown below will appear.

In this situation the operator should immediately disconnect the Fault Mapper from the cable.



4.9 Determining and Measuring Vp Values

Velocity of Propagation (Vp) values are characteristic of each cable type and brand.

The Vp is used to measure the length of a cable and to measure a fault location. The more accurate the Vp, the more accurate the measurement result will be.

The cable manufacturer may list the Vp on their specification sheet or may be able to provide it when asked. Sometimes this value is not readily available, or the user may wish to determine it specifically to compensate for cable batch variations or for special cable applications.

This is quite easy:

1. Take a cable sample of exact length increments (ft or m) longer than 60ft (20m).
2. Measure the exact length of the cable using a tape measure.
3. Connect one end of the cable to the Fault Mapper (see § 4.11). Leave the end unterminated and make sure the wires do not short to each other.
4. Measure the length and adjust the Vp until the exact length is displayed.
5. When the exact length is displayed, Vp is established.

4.10 Selecting a Library Cable or Setting Vp

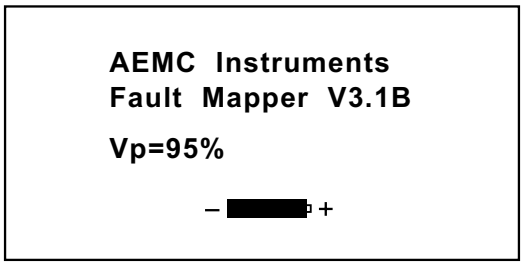
Press the **Vp▲** and **Vp▼** buttons to move up and down through the library.

4.10.1 Cable Library

Cable Type	Vp (%)	Z (Ω)
A.I.W 10/4	47	50
A.I.W 16/3	53	50
Alarm Belden	62	75
Alarm M/Core	59	75
Alumaflex XHHW-2	57	50
Belden 8102	78	75
Belden 9116	85	75
Belden 9933	78	75
CAT5 STP	72	100
CAT5 UTP	70	100
Cirtex 12/2	65	50
Coax Air	98	100
Coax Air Space	94	100
Coax Foam PE	82	75
Coax Solid PE	67	75
Coloniel 14/2	69	50
CW1308	61	100
Encore 10/3	65	50
Encore 12/3	67	50
Encore HHW-2	50	50
Ethernet 9880	83	50
Ethernet 9901	71	50
Ethernet 9903	58	50
Ethernet 9907	78	50
General 22/2	67	50
IBM Type 3	60	100
IBM Type 9	80	100
Main SWA	58	25
Multicore PVC	58	50
RG6/U	78	75
RG58 (8219)	78	50
RG58 C/U	67	50
RG59 B/U	67	75
RG62 A/U	89	100
Romex 14/2	66	25
Stabiloy XHHW-2	61	100
Telco Cable	66	100
T&E BS6004	54	50
Twinax	66	100
URM70	69	75
URM76	67	50

If the cable to be tested is not listed in the library, or a different Vp is required, continue pressing the **Vp ▲** button, past the top of the library.

Vp will be displayed with a value, which can be selected from 1 to 99%. If the Vp value is not known, see § 4.9.



NOTE: When the Fault Mapper is turned off, it will remember the last selected Cable Library or Vp setting. This feature is useful in the situation where the operator is performing many tests on the same type of cable.

4.11 Attaching a Cable to the Fault Mapper

1. Make sure that there is no power supply or equipment attached to the cable to be tested.
2. Check that the far end of the cable is either open or shorted (not fitted with a resistive termination).
3. Attach the Fault Mapper to one end of the cable to be tested.

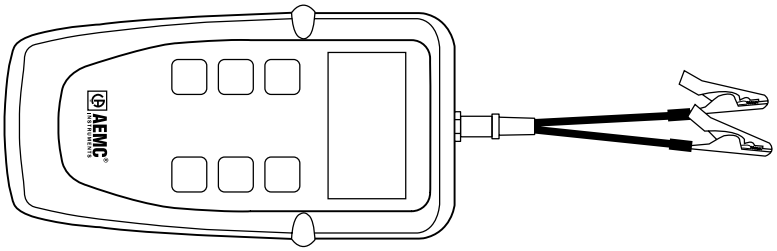
The cable attachment is via a BNC connector located at the top of the unit. For unterminated cables use the alligator clip attachment provided.

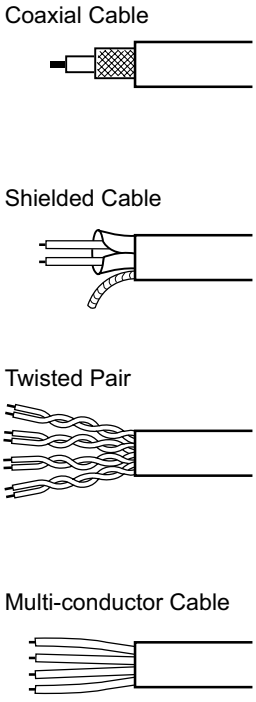
Coaxial Cable: Connect the **Black clip to the center wire** and the Red clip to the shield/screen.

Shielded Cable: Connect the **Black clip to a wire adjacent to the shield** and the Red clip to the shield.

Twisted Pair: Separate out one pair and connect the red and black clips to the two wires of the pair.

Multi-conductor Cable: Connect the clips to any two wires.



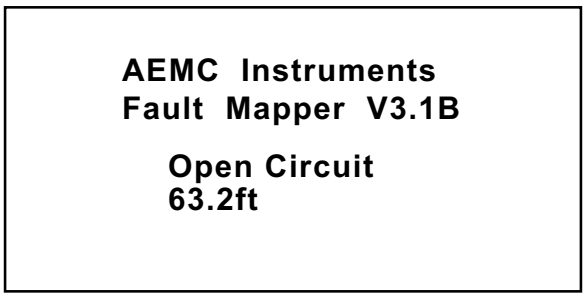


4.12 Measuring Cable Length or Fault Distance

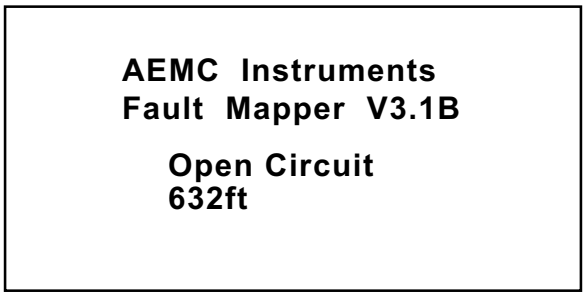
- Select the cable type from the library (see § 4.10) or select the cable Vp (see § 4.9) and attach to the cable to be tested as previously described in § 4.11.
- Press the **TEST / ▼** button.

Assuming there are no opens or shorts in the cable, the length of the cable will be displayed.

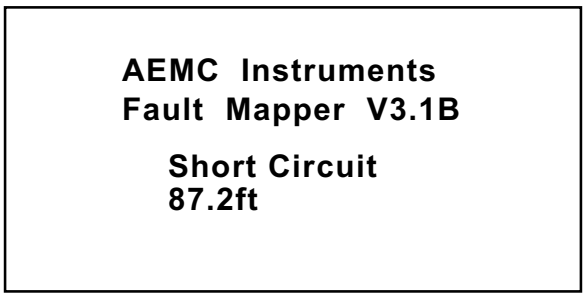
For lengths less than 100 ft, the displayed value will be to one decimal place.



For lengths over 100 ft the decimal place is suppressed.



If there is a short at the end of the cable or at some point along the cable, then the display will show the distance to the short.



MAINTENANCE

Use only factory specified replacement parts. AEMC® will not be held responsible for any accident, incident, or malfunction following a repair done other than by its service center or by an approved repair center.

5.1 Changing the Battery

⚠ Disconnect the instrument from any cable or network link.

1. Turn the instrument OFF.
2. Loosen the 2 screws and remove the battery compartment cover.
3. Replace the batteries with 4 x 1.5V AA alkaline batteries, observing the polarities.
4. Reattach the battery compartment cover.

5.2 Cleaning

⚠ Disconnect the instrument from any source of electricity.

- Use a soft cloth lightly dampened with soapy water.
- Rinse with a damp cloth and then dry with a dry cloth.
- Do not splash water directly on the instrument.
- Do not use alcohol, solvents or hydrocarbons.

5.3 Storage

If the instrument is not used for a period of more than 60 days, it is recommended to remove the batteries and store them separately.

Repair and Calibration

To ensure that your instrument meets factory specifications, we recommend that it be scheduled back to our factory Service Center at one-year intervals for recalibration, or as required by other standards or internal procedures.

For instrument repair and calibration:
You must contact our Service Center for a Customer Service Authorization Number (CSA#). This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container.

(Or contact your authorized distributor)

Costs for repair and standard calibration are available.

NOTE: You must obtain a CSA# before returning any instrument.

Technical and Sales Assistance

If you are experiencing any technical problems, or require any assistance with the proper operation or application of your instrument, please call, mail, fax or e-mail our technical support team:

NOTE: Do not ship Instruments to our F(xborough, MA address.

Limited Warranty

The Model CA7024 is warranted to the owner for a period of two years from the date of original purchase against defects in manufacture. This limited war-ranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused or if the defect is related to service not performed by AEMC® Instruments.

For full and detailed warranty coverage, please read the Warranty Coverage Information, which is attached to the Warranty Registration Card (if enclosed) or is available at www.aemc.com. Please keep the Warranty Coverage Information with your records.

What AEMC® Instruments will do: If a malfunction occurs within the warranty period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will, at its option, repair or replace the faulty material.

Warranty Repairs

What you must do to return an Instrument for Warranty Repair:

First, request a Customer Service Authorization Number (CSA#) by phone or by fax from our Service Department (see address below), then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment pre-paid to:

Caution: To protect yourself against in-transit loss, we recommend you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

Tabla de Contenidos